Indian Ocean from altimetry assimilated into, a shallow-water model

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Topex-Poseidon allows for the first time to accurately observe the large scale sea-level variations induced by the Indian monsoon: those are twice larger than what was observed with Geosat. A shallow-water model forced by contemporary winds is able to reproduce part of this signal with a good correlation. It is shown that the large-scale variations are highly nonlinear: they depend on the mean circulation which is poorly known.

An estimate of the "absolute" ocean dynamic topography is derived at each Topex-Poseidon cycle using altimetric data and a combination of JGM2 and OSU91A geoid. This "absolute" signal is developped into spherical harmonic components up to degree and order 30. The development is constrained only over the ocean and by an a-priori norm derived from Levitus sampled by Topex-Poseidon satellite. It is checked that this development preserves quite well the mean value and large scale component of the signal.

These observations are then assimilated in the adjoint code of the non-linear shallow-water model in order to optimize the initial conditions and the mean absolute dynamic topography of the ocean model. In other words, if the ocean model was perfect, this would provide a correction for the geoid. Data are introduced with an observation error which takes into account the geographical correlation of orbit and tidal error. The impact of assimilation is particularly strong in the region of the throughflow and the South Equatorial Current. It is shown that, given the observation error, model and data are not consistent everywhere nor always. The next step is to improve the ocean model.